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AF IN 49515 - Dept. of Air Force

Outline of Board Inquiry

Picture of U-2 Wreckage

Picture of Khrushchev and Aides

Picture of Wreckage

Picture of Khrushchev and Wreck.

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Trial of The U-2

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Board of Inquiry Attachment A

Exhibit # 1

" # 2

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Exhibit # 11

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SET OF QUESTIONS

Index for Tapes

Index for Trial of The U-2

Index for Board of Inquiry

1 box of Index Cards

OGC Has Reviewed

USAF review(s) completed.

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D.C.



27 February 1962

MEMORANDUM FOR: Director of Central Intelligence

SUBJECT: Technical Analysis of Powers U-2 Incident

1. Pursuant to the request contained in the memorandum of your General Counsel, subject as above, dated 23 February 1962, and the verbal instructions of the Secretary of the Air Force, the 1 May 1960 Powers U-2 flight was analyzed using the information available within the Central Intelligence Agency and the United States Air Force.

2. Qualified Air Force specialists in aircraft structures, intelligence, and operations were assembled in Washington on 23 February 1962. They were organized into three groups and assigned tasks in their areas of competence. These were (1) Operational Procedures Group, (2) the Aircraft Structures Group, and (3) the Intelligence Group. Selection of these specialists was made to take advantage of a combination of their knowledge of U-2 operations in general, the U-2 incident specifically, both specific and general Air Force intelligence, and aircraft structural engineering analysis. There is attached a short statement by each member which sets forth the basis for his particular qualification for participating in this technical analysis.

3. Each group was instructed to make technical findings and submit separate reports based on ascertainable facts from the

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testimony, engineering data, interrogations, photographs, reports, and collateral intelligence furnished to us by your Agency or from Air Force files. The Air Force officer commanding the detachment to which Powers was attached, the briefing officer for the mission, and the backup pilot for the flight in question were available for technical advice.

4. The findings of each group were carefully examined by the senior military member of the other two groups; there are no inconsistencies and the reviewing officers agree with all the findings.

5. The attached reports and findings of each group are self-explanatory. Except for the question raised by the NSA evaluation of recovered Soviet tracking, the technical analyses support the plausibility of Mr. Powers' description of his flight and subsequent descent.


W. M. BLANCHARD
Lieutenant General
United States Air Force

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Tab A - Memorandum, subject - Technical Analysis of Powers U-2
Incident, dated 23 February 1962.

Tab B - Report of Aircraft Structures Group.

Tab C - Report of Operational Procedures Group.

Tab D - Report of Intelligence Group.

Tab E - Biographical Statement of Team Members:

Operational Procedures Group

1. Lieutenant Colonel Sidney W. Brewer
2. Major James R. Bedford, Jr.
3. Captain Charles B. Stratton

Aircraft Structures Group

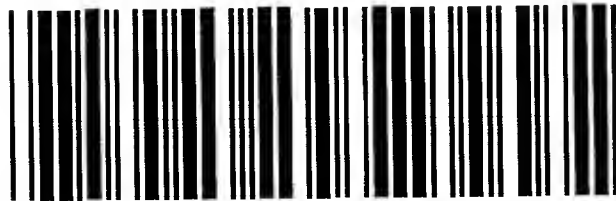
4. Mr. Sydney Berman
5. Mr. William B. Miller
6. Major Hunter W. Anderson
7. Captain Don Seehafer

Intelligence Group

8. Major Harry N. Cordes
9. Major Joseph R. Peartree



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ATTACH

ATTACHMENT SEPARATOR SHEET

CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D.C.

23 February 1962

MEMORANDUM FOR: Lt. General W. H. Blanchard
The Inspector General
United States Air Force
Washington 25, D. C.

SUBJECT: Technical Analysis of Powers - U-2
Incident

In accordance with our understanding with Secretary of the Air Force Zuckert, the Director of Central Intelligence desires a technical analysis by appropriate Air Force personnel to determine insofar as is possible what happened to the U-2 Powers was flying on May 1, 1960, which caused its descent and what the circumstances of the plane's descent were. Specifically, the Director desires an opinion of the Air Force personnel involved as to whether, based on all the information available, statements made by Mr. Powers appear to be consistent with the facts and if not what alternate theories or conclusions appear to be best supported by the evidence. I understand you will be responsible for coordinating this analysis and furnishing a report thereon to the Director of Central Intelligence.

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LAWRENCE R. HOUSTON
General Counsel

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REPORT OF THE STRUCTURES GROUP

1. Scope of Group Examination

Examined photographs, drawings, handbooks, stress reports, U-2 accident reports, and statements by Mr. Powers. Specifically, we examined this evidence to determine,

- a. Why the aircraft came down,
- b. How it came down,
- c. At what altitude mission aborted,
- d. Is evidence compatible with statements of Powers.

2. Findings

- a. It appears that the aircraft broke up in the air.
 - (1) Failure of horizontal stabilizer resulting in nose down pitching.
 - (2) Wing failure and subsequent breakup of the aircraft.
- b. The evidence is compatible with Mr. Powers' statements regarding the failure of the aircraft.

3. Areas included in the scope of this group for which a technically substantiated finding has not been made:

- a. The altitude at which initial failure of the aircraft occurred could not be determined by the Aircraft Structures Group.

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4. Discussion, supporting facts, and references for findings:

- a. The photographs show that the horizontal stabilizers failed in an upward direction. Although the low design load factors associated with the U-2 aircraft make it susceptible to a number of factors which could induce structural failure, this failure probably resulted from an applied load external to the aircraft or its systems. Damage to the skin and structure on the lower aft section of the fuselage is indicative of a load applied from the right rear and below. This could have resulted from ground impact, but more extensive frame damage would have been expected if ground impact was the cause of skin and frame separation. This is not inconsistent with Mr. Powers' reconstruction of the incident. Loss of the horizontal stabilizer undoubtedly caused the aircraft to pitch down as stated by Mr. Powers. Photography shows that the left wing failed in an upward direction. The direction of failure of the right wing cannot be determined; however, we are not so concerned with the direction of failure as we are concerned with the fact that the wings did fail in the air. From the photography, it appears that the aircraft broke up even further, and this is consistent with Mr. Powers'

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statement concerning his report of seeing a tumbling object while he was descending in his parachute.

b. References:

Photographs of the U-2 wreckage in Gorki Park, Moscow.

Basic Structural Loads Analysis Lockheed Report 11055.

Mr. Powers' statements.

5. Discussion regarding areas for which no findings are submitted.

- a. Breakup altitude of the aircraft cannot be determined from photography.
- b. There is evidence that some damage was inflicted to parts of the aircraft after ground impact. No conclusion is drawn as to the source of this damage.

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Supplement to the Report of the Structures Group

A cursory analysis of the requirements to create the overpressure required to fail the horizontal stabilizer suggests that at 70,000 feet accuracies in the order of 100 - 150 feet would be required with a High Explosive warhead of the size attributed to the SA-2 missile. The fragmentation at this close range could be expected to show shrapnel damage at the rear end of the fuselage. It is noted that there was no shrapnel damage at this part of the wreckage. Intelligence analysis has indicated that a very narrow dispersion pattern of fragmentation is probably associated with the SA-2 which could perhaps be consistent with the shrapnel holes noted in the right wing and not in the tail. At very high altitudes the components of the fuel and High Explosive composition could be expected to create an orange glow. The proximity required to create the overpressures nevertheless does suggest a greater awareness of explosion by the pilot than was reported.

A nuclear equipped warhead could more readily have created the overpressures. It is noted that there is no collateral intelligence to support the possibility of a nuclear warhead; however, this possibility does exist.

Both of these matters require more detailed analysis and all of the above must be considered as provisional.

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REPORT OF OPERATIONAL PROCEDURES GROUP

1. Scope of Group Examination:

This group reviewed the debriefing tapes of Francis Gary Powers, the available Board of Inquiry reports, maps, photographs, and other collateral data relating to the operational aspects of this particular mission.

2. Findings:

- a. Major structural failure was induced by an unknown cause.
- b. It appears that the aircraft failed to the extent that elevator control was lost, causing an uncontrollable descent that exceeded aircraft structural design limits and resulted in subsequent disintegration of the airframe
- c. It is the opinion of the operations group that the aircraft descended in a near vertical path from the position at which the break-up occurred.
- d. Powers' description of his flight and subsequent descent was consistent with accepted techniques and procedures and the experiences of other U-2 pilots.

3. Discussion and Supporting Facts for Findings:

- a. Major structural failure was induced by an unknown cause. Five possible reasons for this structural failure were considered. These are: Soviet defensive action, pilot technique, auto pilot malfunction, clear air turbulence, and physiological factors, each of which is discussed separately below.

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- (2) The probability of the aircraft being allowed to nose down and pass through the limiting mach number because of improper pilot technique is negated by the reasoning of Major Bedford and Captain Stratton. These currently qualified U-2 pilots have experienced many instances of the aircraft entering the high speed buffet which occurs prior to reaching the limiting mach. There is little or no difficulty in recovering from this condition even for inexperienced pilots. It is reasonable to assume that a U-2 pilot with Mr. Powers' experience would have encountered this condition many times previously and would have readily recognized the onset of buffet.
- (3) An auto pilot malfunction was considered to be the probable cause of a U-2 accident on 2 January 1962. The malfunction occurred at 68,000 feet and resulted in the aircraft becoming uncontrollable and breaking up in flight. The

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description of events by the pilot of this aircraft is very similar to that of Mr. Powers from the point where pitch control was found to be ineffective through subsequent bail out. While it is considered that an auto pilot malfunction could have caused the loss of the U-2, it is to be noted that Mr. Powers stated throughout interrogation and in his testimony that he was flying the aircraft manually at the time of the incident.

- (4) Clear air turbulence has been encountered from time to time by U-2 aircraft at 65,000 to 70,000 feet of such severity to cause concern for the safety of the aircraft. No U-2 accidents have been attributed to clear air turbulence; however, this could not be positively ruled out as the cause of structural failure. During the interrogation Mr. Powers reported that the air was smooth, and his description of the incident is not characteristic of an aircraft entering turbulence.
- (5) Physiological factors such as hypoxia, sudden illness, or other physical disability could have caused loss of control of the aircraft. Mr. Powers stated that he was fully conscious throughout the entire incident to the best of his knowledge. There is no evidence related

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to these factors other than Mr. Powers' statement and the fact that he was under observation of a flight surgeon prior to take off.

The Operational Procedures Group was unable to identify which, if any, of the above factors was the specific cause of the major structural failure in the U-2.

- b. Loss of elevator control would be an immediate result of structural failure of any substantial part of the horizontal tail group. Such failure would result in loss of control yoke back pressures similar in feel to that described by Powers. The aircraft would nose over and rapidly gain speed sufficient to fail the wing structure. Mr. Powers' statements concerning this portion of the events are almost identical to those made by Colonel Jack Nole, 4080th SRW, describing events occurring to him such as the rapid acceleration, the inverted aircraft attitude, and the sequence of egress.
- c. Knowledge of four accidents involving break-up of the aircraft at high altitude is the basis for concluding that the various parts descended to the ground in a near vertical path. In each of these four accidents, the wreckage was found below the point of occurrence and along a straight line 8 to 10 miles long. (One collateral report stated

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that the wreckage of Powers' U-2 was scattered along a 15 KM [8 miles] line.) Photographs of the wreckage of Powers' plane revealed that the wings of the aircraft failed at approximately the same structural locations as in the other four accidents. The wings and some other lightweight parts were in relatively good condition, suffering an almost identical degree of damage as the other four aircraft; the major difference noticed was the presence of multiple skin punctures in the wings. No definite theories as to what caused the punctures are advanced by this group.

- d. The members of this group found from reading the debriefing of Mr. Powers that his statements relative to operational procedure, technique and sequence of events were consistent. Following is some of the reasoning for arriving at this conclusion:

(1) Mr. Powers' detailed description of the sequence of events during the break up of the aircraft and subsequent bail out are consistent with those related by other pilots who survived high altitude U-2 aircraft break up. A U-2 break up accident occurred from about 68,000 feet on 2 January 1962. The pilot, Captain Charles B. Stratton related the sequence and sensations of the events almost identical to Powers' description.

(2) The variation from the intended flight path while flying over weather and the correction made when breaking into

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the clear is entirely reasonable. With the existing check points in the area, visual pilotage navigation would have been easily accomplished. It is, therefore, concluded that Mr. Powers was capable of being in the geographical position that he reports. (A position error of one to two miles is considered a normal limit of error.)

- (3) Procedures described by Mr. Powers in aircraft operation and mission accomplishment are entirely consistent with recommended techniques, for example
- (a) His statement concerning being 20 to 30 miles off course after having flown overweather for a long period of time is a normal occurrence and considered within the normal limitations of dead reckoning navigation.
 - (b) The reported problems he experienced with the Mach sensor and autopilot are not too infrequent in the U-2. His stated decision to continue his mission by manual flying is reasonable since return to departure base would have required approximately the same flight time as to complete the mission.
 - (c) His description of events during the mission was stated using different words at many different periods during the debriefing interrogation, but no inconsistencies in his reported experiences and actions were noted.

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4. Discussion regarding areas for which no finding is submitted:

A factual determination of the altitude of Mr. Powers' aircraft at the time of the event causing descent could not be made by this group. However, the events described by Mr. Powers relative to aircraft gyrations, "G" forces, difficulty in escape, and pressure suit inflation are consistent with facts obtained from other cases of U-2 aircraft break up which resulted from loss of control at altitudes in the area of 65,000 to 70,000 feet.

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REPORT OF THE INTELLIGENCE GROUP

1. SCOPE OF GROUP EXAMINATION

The Intelligence Group was responsible for examining all available intelligence pertaining to the incident, providing findings, and recommending areas requiring further long-term analysis.

2. FINDINGS

- a. The Intelligence Group was unable to establish what factor precipitated the events leading to the destruction of the U-2.

b.

c.

d.

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3. DISCUSSION, SUPPORTING FACTS, AND REFERENCES FOR FINDINGS

- a. There is no factual information that the Soviets had prior knowledge of the 1 May 1960 mission; [REDACTED]

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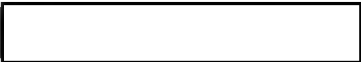
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 In addition, May Day is a major Soviet holiday involving the virtual stand down of all Soviet military flight activity. This does not imply any state of unreadiness on the part of Soviet air defenses; however, this reduction in air traffic would tend to make an unidentified aircraft more conspicuous. All preparations for this mission were apparently normal with the exception that the mission was launched 29 minutes late. This had no significant effect on the mission.

Enroute to the Sverdlovsk area several factors occurred. First,

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- (1) Mr. Powers stated that he had just completed a turn to the right and back to the left so as to properly align the U-2 with the briefed track.
- (2) Shortly after rolling out and establishing the aircraft on track, Mr. Powers stated that he "sensed" an explosion and noted what he described as a "forward boost".
- (3) At approximately the same time, Mr. Powers reported glancing upward and seeing an orange glow.
- (4) At this time, Mr. Powers described a series of events including loss of elevator control and subsequent bailing out of the U-2.

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Evaluation of Mr. Powers^t description of the incident and all other available information does not permit a positive determination of what caused the events described by Mr. Powers immediately above.

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b.

- c. Mr. Powers stated that the incident occurred after he had rolled out on his planned track. He estimated his position to be 20-25 miles southeast of Sverdlovsk.

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LIEUTENANT COLONEL SIDNEY W. BREWER, 49274A
Plans and Programs, Directorate of Systems Management
Aeronautical Systems Division
Wright-Patterson Air Force Base, Ohio

From 1955 to the present date I have been assigned to Wright-Patterson Air Force Base as Chief of the Air Force U-2 Procurement Program. In this assignment I became most knowledgeable of the U-2 aircraft design, construction, and operational environment. I have personally inspected and participated in the investigation of more than twelve U-2 major accidents. Many of these accidents involved break-up of the aircraft at very high altitudes for unknown reasons (similar to the incident in question).

I am forty-two years old and have approximately twenty years service in the Air Force. I was a fighter pilot in World War II and have served as an operations staff officer. I am a command pilot and have approximately 3300 hours military flying time and am current in jet aircraft.

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MAJOR JAMES R. BEDFORD, 24549A
4028th Strategic Reconnaissance Squadron
Laughlin Air Force Base, Texas

I have 910 hours flying time in the U-2, approximately 50% of this time was accumulated in the performance of photographic reconnaissance runs similar to the ones of the mission in question. I have flown four missions along the Soviet Siberian periphery; two of these were in 1959 and two were in 1960.

I have had considerable experience flying the aircraft without the use of the automatic pilot. I flew one mission of about eight hours duration without the automatic pilot and this mission consisted of photographic reconnaissance runs and a celestial navigation leg. I have experienced engine flame outs at feet and lower, and on numerous occasions I have exceeded the limiting mach number.

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I served as a U-2 standardization pilot for seventeen months and have extensive experience in the evaluation of crew performance and reliability.

I am thirty-eight years old and have been in the Air Force continuously since 24 October 1941. My total military flying time is approximately 4,500 hours which has been predominately in fighter type aircraft.

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CAPTAIN CHARLES B. STRATTON, 24284A

4028th Strategic Reconnaissance Squadron
Laughlin Air Force Base, Texas

I bailed out of a U-2 on the night of 2 January 1962. Portions of my experience were very similar to Mr. Powers' experience. The bailout was manual (no ejection).

I am thirty-two years old, have been in the Air Force eleven years and have approximately 500 hours flying time in the U-2. My total flying time is about 3000 hours, mostly in single-engined fighters with some time in the RB-57D.

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SYDNEY D. BERMAN

Technical Director
Directorate of Flight Safety
Norton Air Force Base, California

I am presently Technical Director of the Directorate of Flight Safety, Office of the Inspector General, United States Air Force. During the last seventeen years while employed by the Civil Aeronautics Board and USAF, I have investigated approximately 200 aircraft accidents.

I graduated from the Massachusetts Institute of Technology in 1927 with a Bachelor of Science degree. Since, then, I have been actively engaged in all phases of aeronautical engineering and allied sciences. Some of my positions have been: Project Engineer of the Sikorsky S-41; Assistant Chief of Aerodynamics and Structures, Fairchild Aviation Corporation; Structural Engineer, Civil Aeronautics Administration; Chief of Structures, Preliminary Aircraft Design, Bureau of Aeronautics; Chief of Technical Section, Bureau of Safety Investigation, Civil Aeronautics Board.

WILLIAM B. MILLER

Chief, Structures and Air Environment Division
Aeronautical Systems Division
Wright-Patterson Air Force Base, Ohio

Since 1940 I have been employed with the Air Force at Wright-Patterson Air Force Base, Ohio, in various capacities as a structural test engineer. During my career with the Air Force I have taken part in innumerable aircraft accident investigations and given opinions to investigative boards concerning my analysis and opinion on structural failures.

I am a GS-15 Supervisory Aerospace Engineer, assigned to the Aeronautical Systems Division at Wright-Patterson Air Force Base, Ohio. My specific assignment is that as Chief, Structures and Air Environment Division. I was graduated from Purdue University in 1939 with a degree of Bachelor of Science in mechanical engineering, majoring in aeronautics. I have done graduate studies at Ohio State University.

Since 1952 I have been a member of the National Aeronautical and Space Administration Structures Research Advisory Committee. Since 1955 I have been a member of the Structures and Materials Panel, Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization.

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MAJOR HUNTER W. ANDERSON, 17737A
AFCIN-2B5 Washington 25, D. C.

I was a member of the special Air Force Intelligence Board convened in June 1960 to investigate the 1 May 1960 U-2 incident.

For approximately three years (1958-1960) at the Air Technical Intelligence Center, I was charged with the responsibility and spent a considerable portion of my time making studies on the survivability of the U-2 in the Soviet Air Defense environment.

I have a Bachelor of Science degree in Aeronautical Engineering and approximately 6,000 hours flying time. I have used this background as an intelligence analyst for the past five years specializing in fighter aircraft.

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CAPTAIN DON SEEHAFFER, 27727A

Advanced Plans and Programs Group
Directorate of Systems Management
Aeronautical Systems Division
Wright-Patterson Air Force Base, Ohio

For over three years I have been exclusively assigned to the U-2 System Project Office at Wright-Patterson Air Force Base, Ohio. My duties have been in the engineering and maintenance responsibilities for the U-2.

I am thirty-eight years old and have about fourteen years service in the Air Force. I was graduated from the University of Washington in December 1950 with the degree of Bachelor of Science in Aeronautical Engineering and received a Masters' Degree from Ohio State University in 1961. I became an aircraft maintenance officer in 1951 and since that time I have worked almost exclusively with fighter type aircraft. I completed the aircraft structural design course at the Air Force Institute of Technology in 1954. I was assigned as an aircraft structural engineer, specializing in the design of aircraft, modifications and structural repairs for about three years at depot level.

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I am thirty-nine years old and have twenty years service in the Air Force. I am a senior pilot and a senior navigator with over 6000 hours flying time.

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MAJOR JOSEPH R. PEARTREE, 24582A

AFCIN-2
Washington 25, D.C.

For the past three years I have been intimately associated with all USAF and special reconnaissance activities, particularly with respect to Soviet Air Defense reaction and capabilities. I was a member of the 1960 special AFCIN board established to analyze the 1 May 1960 U-2 incident and I prepared the AFCIN study which reflected the opinions of this board. I have been AFCIN project officer on the 1 May 1960 U-2 incident and the July 1960 RB-47 incident since they occurred.

I am thirty-nine years old, possess a Bachelor of Arts college degree, have twenty years service in the Air Force and have approximately 2900 hours flying time as a pilot.

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